REMARKS

This paper is responsive to an Official Action that was issued in this case on January 3, 2006 and accompanies a Request for Continued Examination. In the Action, claims 1 through 31 were finally rejected, as follows:

- Claims 1-4, 6-9, 16-18, and 21-22 were rejected under 35 USC §102 as being anticipated by U.S. Pat. No. 6,580,864 to Temkin *et al.*
- Claims 10-13, and 29 were rejected under 35 USC §102 as being anticipated by U.S. Pat. No. 5,732,179 to Caneau *et al.*
- Claims 5, 19-20 were rejected under 35 USC §103 as being obvious over Temkin *et al.*
- Claims 14-15, 30 and 31 were rejected under 35 USC §103 as being obvious over Caneau *et al.*
- Claims 23-28 were rejected under 35 USC §103 as being obvious over Caneau *et al.* in view of U.S. Pat. No. 6,704,487 to Parhami *et al.*

Responsive to the Action, claims 1 and 16 have been amended. Reconsideration is respectfully requested in view of the foregoing amendments and the following comments.

35 U.S.C. 102 Rejection of Claims 1-4, 6-9, 16-18, and 21-22

Claims 1-4, 6-9, 16-18, and 21-22 were rejected under 35 U.S.C. 102 as being anticipated by U.S. Pat. No. 6,580,864 to Temkin.

Amended claim 1 recites an article comprising:

> (a). a composite guiding region having at least three layers, wherein two of said three layers have stress of the same sign;
> said two layers are separated by one or more interposed layers;
> said one or more interposed layers have stress of opposite sign relative to said two layers; and
> said interposed layers are suitable for guiding light based on the relative refractive indices of said interposed layers and said two layers;
> (b). a lower cladding, *wherein said composite guiding region is disposed above said lower cladding*; and
> (c). an upper cladding, *wherein at least a portion of said upper cladding is disposed above said composite guiding region.*

(Emphasis supplied)

Nowhere does Temkin teach or suggest, alone or in combination with the other references, what amended claim 1 recites; namely, a composite guiding region that is distinct from and disposed between lower and upper claddings, wherein the composite

guiding region comprises two outer layers interposed by at least one layer, and wherein at least one interposing layer has stress of the opposite sign relative to the two outer layers.

For this reason, claim 1 is allowable over Temkin. Due to their dependence on claim 1, claims 2-4 and 6-9 are likewise allowable. Furthermore, the recitation of additional patentable features in these dependent claims provides a secondary basis for their patentability. The Office is therefore requested to withdraw the rejection of claims 1, 2-4, and 6-9 over Temkin.

Claim 16, as amended, recites:

> **16.** A method of forming a surface waveguide comprising:
> forming a lower cladding on a substrate;
> *forming a composite guiding region above said lower cladding*, wherein forming said composite guiding region comprises:
> (a). depositing a first conformal layer comprising a first material having a first stress;
> (b). depositing on said first conformal layer a second conformal layer comprising a second material, wherein said second material has a second stress of opposite sign relative to said first stress; and
> (c). depositing on said second conformal layer a third conformal layer of a third material, wherein said third material has a third stress of the same sign relative to said first stress; and
> forming an upper cladding, wherein *at least a portion of said upper cladding layer is disposed above said composite guiding region*.

(Emphasis supplied)

Nowhere does Temkin teach or suggest, alone or in combination with the other references, what amended claim 16 recites; namely, forming a composite guiding region that is distinct from and disposed between lower and upper claddings, wherein the composite guiding region comprises two outer layers interposed by at least one layer, and wherein at least one interposing layer has stress of the opposite sign relative to the two outer layers.

For this reason, claim 16 is allowable over Temkin. Because claims 17, 18, 21, and 22 are dependent on claim 16, they are likewise allowable over Temkin. The recitation of additional patentable features in these dependent claims provides a secondary basis for their patentability. The Office is therefore requested to withdraw the rejection of claims 16-18, 21, and 22 over Temkin.

35 U.S.C. 103 Rejection of Claims 5, 19 and 20

Claims 5, 19 and 20 were rejected under 35 U.S.C. 103(a) as being unpatentable over Temkin. According the Examiner, Temkin did not explicitly teach certain materials for use as the cladding or core, as recited in claims 5, 19, and 20. But the Examiner alleged that the use of such materials would be obvious to one skilled in the art and so rejected these claims.

Claim 5 is dependent upon claim 1, and claims 19 and 20 are dependent upon claim 16. As discussed above, independent claims 1 and 16 have now been amended to distinguish between the composite guiding region and the lower and upper claddings. In view of these amendments, the deficiencies in the disclosure of Temkin, vis-à-vis the inventions recited in claims 5, 19, and 20, go well beyond the omission of certain materials for use as the cladding or core. And, as a consequence, claims 5, 19, and 20 are not obvious in view of Temkin. The Office is therefore requested to withdraw the rejection of these claims.

35 U.S.C. 103 Rejection of Claims 16 and 23 through 28

Claims 16 and 23 through 28 were rejected as being obvious U.S. Pat. No. 5,732,179 to Caneau in view U.S. Pat. No. 6,704,487 to Parhami.

Nowhere does Caneau or Parhami teach or suggest, alone or in combination with the other references, what claim 16 recites. That is, there is no disclosure or suggestion to form a composite guiding region that is distinct from and disposed between lower and upper claddings, wherein the composite guiding region comprises two outer layers interposed by at least one layer, and wherein at least one interposing layer has stress of the opposite sign relative to the two outer layers.

As discussed in detail in applicants' amendment dated 2/21/2006, there would be no motivation to combine the techniques disclosed in Parhami with the *semiconductor* waveguides disclosed in Caneau. Further support for the lack of motivation is provided below.

Caneau teaches a semiconductor waveguide comprising alternating layers of group III-V and/or group II-VI semiconductors. Caneau introduces birefringence in the guiding region of the semiconductor waveguide through the mismatch of the lattice constants of the layers. Caneau discloses that "[t]he optical birefringence can be manipulated by the controlled introduction of strain into the signal-bearing semiconductor layers. These layers

may be epitaxially grown on an underlying substrate of a different composition and slightly different lattice constant if strain can be accommodated without material relaxation." (*See, e.g.*, col. 7, lines 12-17.)

It is important to understand that there is no strain within an individual homogenous layer of crystalline material. The strain in the semiconductor layers of Caneau's waveguides arises due to difference between the atomic crystal lattices of adjacent layers (wherein the adjacent layers comprise different semiconductors). This strain is induced at the atomic level; it is NOT a bulk material property. In addition, it is ONLY applicable to a crystalline material, such as a semiconductor.

Parhami discloses the formation of "stress-relief" trenches, which are disposed adjacent to the guiding region of *thermo-optically-active* waveguides. The purpose of the trenches is to relax lateral bulk material stress in the non-crystalline materials of which Parhami's waveguides are composed.

Parhami explains how the problem of birefringence arises in active PLC devices. According to Parhami, thermally-induced birefringence results from the thermo-optic effect, wherein the refractive index of the core of the silica waveguides that are used in PLC-based thermo-optic devices change as the temperature is changed." (*See, e.g.*, col. 2, lines 12-17.)

So Parhami addresses this problem via his trenches: "[t]he first and second trenches balance the stresses by allowing the top cladding to more readily expand." (*See, e.g.*, col. 4, lines 10-12.)

But the formation of these trenches would have NO effect on the atomic-level stresses induced in the waveguides disclosed by Caneau. And there will be no thermally-induced birefringence of consequence in Caneau's waveguides. Since Parhami's stress-relaxation trenches are only effective for controlling bulk material stresses, there would be NO motivation to modify Caneau to include the trenches. Simply put, they won't do anything.

The Examiner argued that Parhami teaches "removing portions of waveguide layer materials and forming trenches in fabricating waveguides structure with low birefringence (abstract)." The Examiner further alleged that such feature is "considered advantageous and desirable because it provides additional relief from internal stress of the waveguiding layers and lowers undesired birefringence." Therefore, the Examiner concluded, it would be

obvious to "modify the device of Caneau to have portions of the waveguiding layers removed as taught by Parhami."

It should now be clear that it would NOT be advantageous or desirable to use such trenches in the Caneau waveguides because they will NOT provide any additional stress relief. Again, the only strain of consequence in Caneau arises at the atomic level, for which the Parhami trenches provide no strain relief.

For this reason, among others, claim 16 is allowable over the combination of Parhami and Caneau. Due to their dependence on claim 16, claims 23-28 are likewise allowable. Furthermore, the recitation of additional patentable features in these dependent claims provides a secondary basis for their patentability. The Office is therefore requested to withdraw the rejection of claims 16 and 23-28 over Parhami and Caneau.

Conclusion

It is believed that claims 1-31 now presented for examination are in condition for allowance. As a consequence, the Examiner is requested to allow all of the pending claims and pass the application to issue.

Respectfully,

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